2007 RESEARCH PROBLEM STATEMENT

Problem Title: Optimization of Mixture Designs using Ternary Blends of Cementitious Materials **No.:** 07.03-06

Submitted By: Paul Tikalsky **Email:** tikalski@civil.utah.edu

Project Champion: Degen Lewis

(UDOT or FHWA employee who needs this research done, will help the Research Division lead this project, and will spearhead the implementation of the results. If the project gets prioritized at the UTRAC conference, a Champion Commitment Form will be required before funding.)

1. Briefly describe the problem to be addressed.

The intent is to investigate the options available for using additional types of cementitious materials other than Portland Cement. The investigation also reviews the purported challenges and constraints associated with these types of cement. This is support of and existing Pooled Fund Study (TPF-5(117)/ 932) of the same topic.

The goal of this project is to provide the quantitative information needed to make sound engineering judgments pertaining to the selection and use of supplementary cementitious materials in conjunction with portland or blended cement. This will lead to a more effective utilization of supplementary materials and/or blended cements enhancing the life-cycle performance and cost of transportation pavements and structures. The efforts of this project will be directed at producing test results that support the following specific goals:

· Provide quantitative guidance for ternary mixtures that can be used to enhance the performance of structural and pavement concrete
· Provide a solution to the cold weather issues that are currently restricting the use of blended cements and/or supplementary cementitious materials
· Identify how to best use ternary mixes when rapid strength gain is needed
· Develop performance-based specifications for concrete used in transportation pavements and structures

2. Strategic Goal: ☒ Preservation ☐ Operation ☐ Capacity ☐ Safety (check all that apply)

3A. List the research objective(s) to be accomplished:

1. Determine advantageous combinations of tenary cementitious systems for 10 different durability characteristics.
2. Review existing use of ternary mixtures throughout the US. Use of UT materials is anticipated.
3. Correlate taboratory testing to field performance of ternary concrete mixtures.
4. Drive a classification that is in conjunction with ASTM 1157, Blended Cements.
5. Implement a field study in UT utilizing ternary blends in adverse conditions.

3B. List the major tasks to accomplish the research objective(s): **Estimated person-hours:** 100

1. Mortar scoping tests on 144 cementitious-material combinations.
2. Evaluate full-scale concrete mixtures containing ternary blends for field and lab performance.
3. Provide technical assistance to Contractors and SHAs on the use of ternary blends.
4. Assist in construction and inspection of ternary cementitious-mixtures in the field.
5. Evaluate the field projects.

4. Estimate the cost of this research study including implementation effort (use person-hours from No. 3B): $15k x 4 Years

5. Indicate type of research and/or development project this is

Large: ☒ Research Project ☐ Development Project
Small: ☐ Research Evaluation ☐ Experimental Feature ☐ New Product Evaluation ☐ Tech Transfer Initiative
☐ Other: _____

(A small project is usually less than $20,000 and shorter than 6 months)

6. Outline the proposed schedule (when do you need this done, and how will we get there):
June 1, 2007 starts year 2 of 5 year program. Fund and program run through 2011.

7. What type of entity is best suited to perform this project (University, Consultant, UDOT Staff, Other Agency, Other)?
Existing Pooled Fund using University

8A. What deliverables would you like to receive at the end of this project? (e.g. useable technical product, design method, technique, training, workshops, report, manual of practice, policy, procedure, specification, standard, software, hardware, equipment, training tool, etc.)
- All documentation and benefits produced under the pooled fund.
- Presentation to UDOT personnel on Pooled Fund results

8B. Describe how this project will be implemented at UDOT.
- Results will be used to modify specifications and design procedures to allow for industry driven mix designs or expectations of longer performing pavements and structures.

8C. Describe how UDOT will benefit from the implementation of this project, and who the beneficiaries will be.
- Reduced cost of producing PCC mixes.
- Reduction of LCC costs using longer performing pavements and structures.

9. Describe the expected risks and obstacles as well as the strategies to overcome them.
None anticipated

10A. List other people (UDOT and non-UDOT) who are willing to participate in the Technical Advisory Committee (TAC) for this study:

Name	Organization / Division / Region	Phone	Email
Paul Tikalsky	University of Utah		tikalski@civil.utah.edu
Leif Wathne	ACPA		
Paul Ingram	Penn DOT		
Tom Cackler	Director, FHWA Concrete Tech Center		
Degen Lewis	UDOT Concrete Engineer	801-964-3814	dlewis@utah.gov

10B. Identify other Utah, regional, or national agencies and other groups that may have an interest in supporting this study:
SEE ABOVE